even in his shy way. At Perugia, Assissi, Arezzo, Bologna, Ferrara, Verona and Padua, he studied the great masters, and at Ferrara he met William Cullen Bryant; at Florence, Powers; and each city had its lesson. He studied Titian and Tintoretto and Paul Veronese in Venice, and compares them with careful analysis of their special qualities. Passing by Verona and Botzen and Innspruck to Munich, where he saw the works of Cornelius and Kaulbach and Hess, all feeble after the great Italians, yet noteworthy and carefully criticised by Rothermel, he visited Nuremberg and Dresden, Leipsic and Berlin, returning by way of Strasburg to Paris, where he exhibited some of his own pictures in the Salon of 1859, receiving honorable mention and escaping (as he puts it) a medal, because the supply was exhausted by the French artists. Returning to Philadelphia, Mr. Joseph Harrison gave him a studio, where he painted "King Lear" (still in Mr. Harrison's gallery); he first made a sketch portrait of Forrest for the head, but afterwards made it entirely ideal, the better to express his own fancy. His productions were bought by Messrs. Clarence H. Clark, John Rice, Matthew Baird, H. C. Gibson, Charles Gibson, E. H. Fitler, W. Dougherty, James S. Martin, and thus he was honored in his own home. He notes that Sully was reported to have received but seventy-five dollars for his fine portrait of George Frederic Cook, the tragedian, which Rothermel thinks "perhaps the very best life-size portrait in the country." In his autobiographical memoir—only a fragment—he records the fact that he painted his "Gettysburg" in Mr. Harrison's studio, and his intention of describing his preparation, his studies and his gradual progress, but unfortunately nothing of this is preserved. It is greatly to be regretted that he did not thus put on record his own story of his greatest picture, that it might be printed as the artist's own analysis. The picture has a place of honor in Harrisburg in the Hall of Trophies of the State Capitol.

Jasper and Stalagmite Quarried by Indians in the Wyandotte Cave.

By H. C. Mercer.

(*Read before the American Philosophical Society, November 16, 1895.*)

I beg to call the attention of the Society to these objects from the Wyandotte cave in Indiana, as illustrating one of the features of what might be called the comparatively modern archæology of caverns, one of the relations of the daily life of the North American Indian to subterranean galleries in the limestone.

Before describing the specimens, from the Museum of American and Prehistoric Archæology of the University of Pennsylvania, let me say that I have been drawn into the exploration of caves in the hope of finding in the *Cultur Schichten*, as the Germans call them, or the layers of human rubbish superposed in series on the subterranean floors by

ancient visitors, and representing epochs of human habitation, some positive proof as to the antiquity of man on the American continent.

Just as the Drift Hunter, the oldest proved inhabitant of Europe, was found to have left traces of his presence in caves, just as the prehistoric European epochs of human culture, bronze under iron, then polished and then chipped stone, were found to be represented in caves by the superposition of films of this rubbish resting one above the other, so here in America we may hope to find similar evidence, if it exists. If the Indian had a predecessor, we may expect to reveal proof of his presence in some cavern not difficult to discover, while if the Indian were an inhabitant in geologically ancient times, we ought to be able to demonstrate the fact, as such facts have been demonstrated before, by the occurrence of his relics associated with geologically older or extinct animals in the subterranean rubbish.

As far as a search in the Eastern United States is concerned, the topography of the region east of the Mississippi has seemed to have an important bearing on the question. No doubt many caves could be eliminated from the investigation for the sake of a first look at others which appeared, by their position, to constitute a key to the situation. The thick precolumbian forest was traversed from northeast to southwest by a wooded mountain chain, and, as it was likely that early peoples had crossed this barrier to reach the Atlantic seaboard, it has seemed probable that the caves fronting practicable mountain passes, running from east to west, the traversing river valleys, in other words, would likeliest contain traces of all the immigrants that passed that way.

So making use of the indispensable advice and assistance offered us by Professor Cope, we turned our attention to the two most important of these river pathways, and after a search with significant results in the Lookout cave on the Tennessee river at Chattanooga, and again at the awe-inspiring Nickajack cavern farther down stream, took for a time as our special field the longest and most practicable mountain and forest pass of all, the New river-Kanawha-Ohio Valley. By following this, it may be said that a foot wanderer could, at least pains and at best advantage, proceed as primitive immigrants would proceed, eastwardly through the forest and across the mountains to the Atlantic shore. Starting therefore at the head-waters of the New river in Virginia, advancing in a canvas boat down the rushing and rocky current, using railways where they helped us, and then wooden boats on the broadening stream when night-camping was abandoned, we followed the New river into the Kanawha, the Kanawha through its deep gorge into the Ohio, and the Ohio nearly to its mouth in the Mississippi, examining all the caves and rock shelters by the way.

The time has not come to describe in full or fairly estimate the evidence thus collected. Suffice it here to say, that as compared with prehistoric Europe everything was modern, that while in Europe you have

many cave layers, here we found but one, namely, that representing the North American Indian, and, finally, that while in Europe human relics in the cave layers evidently reach back into geologically ancient times, because of their association with the bones of extinct animals, here, with two exceptions, the bones of animals, cooked and eaten by the cave visitors, were modern. In other words we had failed thus far to find any evidence of a race of mound builders antedating the Indian, or any trace of the socalled Paleolithic man, who, if he existed in the eastern United States, had, strange to say, avoided these caves, which had not only given shelter to the Red Man, but, as bits of glass, buttons and leather on the surface abundantly showed, had continually tempted the ingress of the white man.

Leaving, however, the presence of older layers in any Eastern caves to be settled by further search, since it may be doubted whether we have examined enough caves as yet to have banished Paleolithic man from the Appalachian region, let us repeat that there was abundant evidence to show that the modern Indian resorted to caves, for which reason the Wyandotte cavern, near Leavenworth, in southern Indiana, on the right bank of Blue river, about five miles from its mouth in the Ohio, one of the last caves visited on our expedition, was of peculiar interest. Though there seemed no use digging at its cramped entrance for well-defined culture layers, though the cave, by its secluded position might have been classed among caves difficult to find and therefore of inferior promise to the explorer, nevertheless its archæology, relating to a comparatively modern time, presented considerations of importance, These referred to two discoveries described some fifteen years ago by Mr. H. C. Hovey, of Newberryport, and Mr. Collet, of the Indiana Geological Survey. Before the meaning of Indian jasper quarries had been disclosed at Piney Branch and Flint Ridge, these gentlemen, together with Mr. H. W. Rothrock, owner of the cave, had found not only that the Indians had quarried jasper, but that they had mined and carried away carbonate of lime (stalagmite) from deep underground recesses.

The splinters of jasper here shown were found by me in a room called the "Pillared Palace," and represent the work done by Red Men, when, in the treacherous light of primitive torches, they battered off jasper nodules with quartzite boulders and worked down to partial finish the desired blocks. Mr. Hovey realized that certain irregularities in the floor called till then "Bear Wallows" were the contours of heaps of this roughly chipped débris mixed with charcoal and containing hammer stones, the quarry refuse, in fact, which the Indians had left behind. I saw, as he did, the well-battered jasper nodules protruding in layers from the limestone walls, while, then, in 1894, the chips lay thick under foot. But though charcoal was easy to find on the floor, the boulder hammers had all, save one, been removed, and I failed to discover a finished blade or even one of the ruder wastrels, called "turtle-backs," now so familiar to the searcher at aboriginal quarries.

The other discovery was that of the so-called "alabaster quarry," a place where heavy quartzite boulders had been used to batter away the side of a stalagmite, known as the "Pillar of the Constitution," some two subterranean miles distant from the entrance—a mine in fact in one of the large domed chambers where several cubic yards of the snow-white carbonate of lime had been removed from the vertical wall of an enormous fluted column.

A heap of splinters, from which I picked up these specimens as examples, showing the characteristic rectangular planes of fracture, lay under the hollow, where not only had several quartzite hammer stones been found by Mr. Rothrock, but a pick made of stag's antlers, such as Canon Greenwell found in the subterranean galleries of the Neolithic flint mines at Grimes Graves, in England ; such, as again, M. M. Cornet Briart encountered underground in similar workings at Spiennes, in Belgium, and such as later explorers exhumed at Cissbury, in England, proving the use of stag's horns for digging in the stone age, an adaption of a natural convenience further suggested by a hoard of several score antlers discovered by Mr. S. Grimley's ancestor in a slate rift on Perkiomen creek, Montgomery county, Pa., where they had been probably stored for kindred uses by Indians. Notwithstanding the fact that I could find but one large boulder hammer at the "alabaster quarry," the proof of Indian work at the spot was satisfactory, and of a character, I believed, never noticed and studied before the discovery of the site, though I cannot (on the strength of observations on the growth of stalactites in the *American Naturalist* for December, 1894), with Mr. Hovey, ascribe great antiquity to a crust of stalagmite which partially overflows the quarried hole.* As I knew of no object made of stalagmite among the "Indian relics" in any collection or museum in the United States, it remained to be seen what the Indians did with the quarried fragments ; why they left so many, apparently available, pieces behind, and what kind of fragments were desired. I came to think that it was a question of fineness of grain with them, and adaptability of size and shape to the kind of object intended to be made, so as to escape the great labor of rubbing down, a supposition that appeared more probable later, when I luckily found the other specimen here shown associated with aboriginal rubbish at a place near the entrance of the cave, where evidently the Indian had lost it after having brought it from the quarry, nearly two miles away under ground.

This discovery of my own helped to elucidate the other very interesting question suggested by what I had seen : What lights had the Indians used in their distant and dangerous wanderings and their prolonged quarryings in the cave ? A question finally settled after studying numerous charred fragments of the shellbark hickory, which in

* Stalactites 60 centimetres long and fifteen years old, described by Prof. Franz Adami in the *American Naturalist* for December, 1894.

many places scattered the subterranean floors. I proved, by experiment with fresh bark outside the cave, that three or four pieces a foot long, pulled fresh from the tree and held together in the hand, will burn half an hour, making an excellent torch, which consumes slowly or fast, wanes to an ember or bursts into flame as you hold it up or down or wave it.*

Two-thirds of the Wyandotte cave had been unknown until 1850, when Mr. Rothrock, suspecting a purpose in a wall-like arrangement of stones at the corner of a large passage, removed them, and to his surprise crawled into an ante-chamber, leading into the most spacious and beautiful of the present galleries. The ceiling of this low room then first seen was black with smoke, as it still is, and he described poles, some specimens of which are yet to be found, which appear to have been broken from the parent stem or cut by charring and with stone tools, standing in rows against the wall. Then, as now, fragments of charred hickory bark strewed the floor, while moccasin tracks, now entirely obliterated, led away in many directions over the soft dust. In one corner of the ante-chamber lay then and lies still a heap of grass, sticks, bark, leaves and nuts, (a specimen of which rubbish I show) covered with dust and evidently placed there by the Indians. Digging in this for an hour, I found the little block of stalagmite here shown, which specimen, I believe, the ancient quarrymen had lost, and, for comparison with which, I have brought two other pieces of stalagmite, partly worked and polished, found in one of the cliff dwellings of southern Colorado, one of which is almost the duplicate of the interesting piece found in the Wyandotte ante-chamber. We have thus a chain of evidence. First, to show the quarrying of stalagmite in the cave; second, to specify the kind of fragments sometimes desired and carried away from the quarry, and third, to show that similar fragments were polished and worked by other Indians at other places.

To kindle the hickory bark torch, a good blaze was required, and I infer that the pile of grass and sticks in the ante-chamber was the remnant of a store of fuel resorted to when the torches waned or a relight was needed. Not inconsiderable must have been the danger of a long ramble in the cavern with its alleged twenty-three miles of galleries, when provided only with these primitive lights; and I can imagine that a good many precautions were taken in the way of shouted signals, of comrades left behind, and of watches kept over a sort of reserve fire in the ante-chamber, when, venturing their lives on the chance of a rude fire brand that must never be allowed to go out, the Red Men quarried jasper and stalagmite in the Wyandotte cave.

* I had found bundles of coarse grass tied with *henequen* string used as torches by Indians in the cave of Rancho Chak in Yucatan, and had seen Indians carrying blazing torches of dry cactus stalks to light them in their search for water in the galleries of Loltun, another cavern in the Sierra de Yucatan, near Tabi.